Introduction and Overview

Benzene
(found in gasoline)

Arsenic, mercury, chromium, and lead compounds
(e.g., metal processing operations)

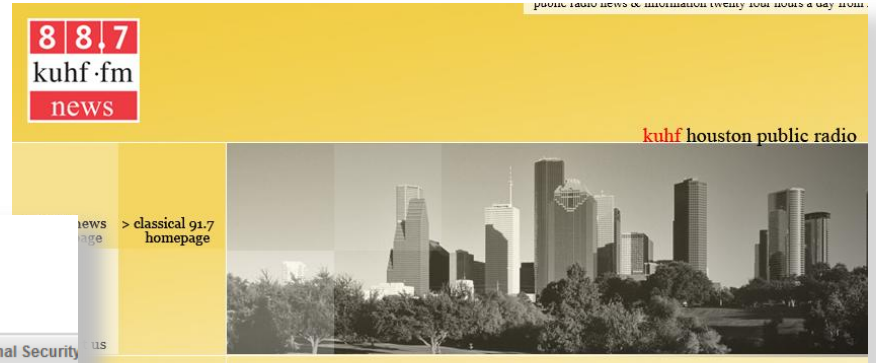
Perchloroethylene
(emitted from some dry cleaning facilities)

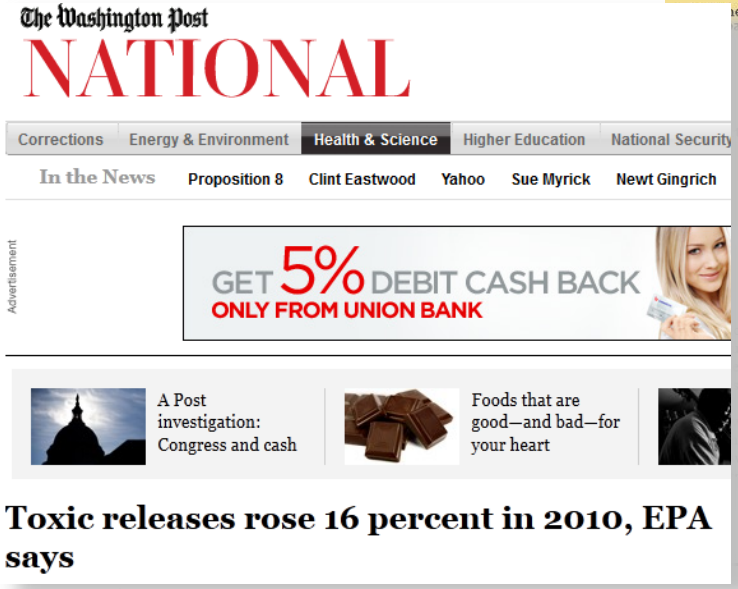
Methylene chloride
(solvent and paint stripper)

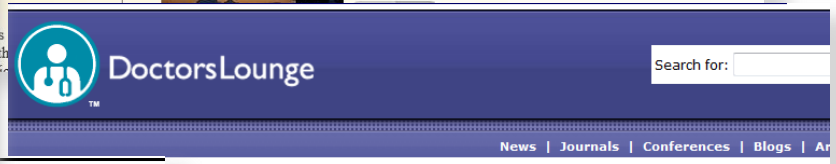
May 2012

Sonoma Technology, Inc.

Motivation


8 8.7
kuhf·fm
news
kuhf houston public radio
> classical 91.7 homepage
Air Toxics Can Leak Near Gas Wells
November 23, 2010
by: Carrie Feibel
Natural gas production is a growing source of air pollution.
companies have sunk 14,000 gas wells into the Barnett Shale
happens regularly in the Houston region too. The state is ste
regulation — but critics wonder if it's enough. KUHF health s
technology reporter Carrie Feibel has more.
listen now:


The Washington Post
NATIONAL
Corrections
Energy & Environment
Health & Science
Higher Education
National Security
In the News
Proposition 8
Clint Eastwood
Yahoo
Sue Myrick
Newt Gingrich
Search
Advertisement
GET 5% DEBIT CASH BACK
ONLY FROM UNION BANK
A Post investigation: Congress and cash
Foods that are good—and bad—for your heart
Toxic releases rose 16 percent in 2010, EPA says


DoctorsLounge
Search for:
News | Journals | Conferences | Blogs


Los Angeles Times
LOCAL U.S. WORLD BUSINESS SPORTS ENTERTAINMENT HEALTH LIVING TRAVEL OPINION
L.A. NOW POLITICS CRIME EDUCATION O.C. WESTSIDE NEIGHBORHOODS ENVIRONMENT
YOU ARE HERE: LAT Home → Collections → Health Hazards
ADS BY GOOGLE
ROBERT HARRIS
HIGH FINANCE MEETS ARTIFICIAL INTELLIGENCE IN THE MOST EXTRAORDINARY
Study Pinpoints 2 Air Toxics Posing Greatest Danger
July 08, 1987 | LARRY B. STAMMER | Times Staff Writer
The greatest risk posed by air toxics to nearly the entire population of Los Angeles and Orange counties comes from benzene, a product of gasoline, and chron
plating operations, the South Coast Air Quality Management District reported Tues
The rankings of the two air contaminants among 20 examined during a two-year st


Headlines:
Category: Family Medicine | Gynecology | Internal Medicine | Nursing | Pulmonology | Journal
Back to Journal Articles
Exposure to Air Toxics in Pregnancy Ups Preterm Birth
Last Updated: October 12, 2011.
Maternal exposure to traffic-related air pollutants during pregnancy, especially polycyclic aromatic hydrocarbons, is associated with an increased risk of preterm birth, according to a study published online Oct. 7 in Environmental Health.
WEDNESDAY, Oct. 12 (HealthDay News) -- Maternal exposure to traffic-related air pollutants during pregnancy, especially polycyclic aromatic hydrocarbons (PAHs), is associated with an increased risk of preterm birth, according to a study published online Oct. 7 in Environmental Health.
Michelle Wilhelm, M.D., from the University of California in
Inter-quartile range increase in polycyclic aromatic hydrocarbon exposure ups risk 30 percent
Orthopedics
Pediatrics

What Are Air Toxics?

- The 1990 Clean Air Act defines 188 hazardous air pollutants (HAPs).
  - The terms “HAPs” and “air toxics” are used interchangeably.
- Air toxics are those pollutants known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects.
  - U.S. Environmental Protection Agency (EPA) is working with state, local, and tribal governments to reduce the release of air toxics into the environment.

U.S. Environmental Protection Agency, 2007c, g

What Are the Health and Environmental Effects of Air Toxics?

- Exposure to air toxics at sufficient concentrations and durations may increase a person's chance of health problems, including
  - cancer
  - damage to the immune system
  - neurological damage
  - developmental problems
  - respiratory problems
  - reproductive problems

Both high values and annual means of air toxics concentrations are of interest because some air toxics have both acute, short-term health effects and chronic, long-term health effects.

- Some air toxics, such as mercury, can deposit onto soils or surface waters, where they are taken up by plants and ingested by animals—and eventually magnified up through the food chain.

U.S. Environmental Protection Agency, 2007c, g

Key Things You Need to Know About Air Toxics

- EPA has sponsored many phases of national-level investigations of air toxics.
- There have also been many community-scale air toxics projects.
- Summaries of results are available: http://www.epa.gov/ttn/amtic/airtoxpg.html

So, what is already known about air toxics at the national and community scale?

Measuring Air Toxics Is Expensive and Complicated

Compared to criteria pollutants,

- Fewer numbers of annual samples achieved (60 vs. 8,400)
- Higher capital costs ($25,000 vs. $15,000)
- Recurring annual costs ($20,000 vs. $2,000)
- More species (30 vs. 1)
- Quality assurance/control (QA/QC) more expensive, complicated, and time-consuming
- Multiple methods needed to capture VOCs, polycyclic aromatic hydrocarbons (PAHs), metals, and carbonyls (FRM vs. TO-3, 11, 14, 15, etc.)

VOCs = volatile organic compounds
FRM = Federal Reference Method)

Most Air Toxics Are Not Routinely Measured

- Although there are thousands of compounds in the air that could cause harm, 188 are listed in the 1990 Clean Air Act.
- Generally, measurements focus on the 33 shown here.

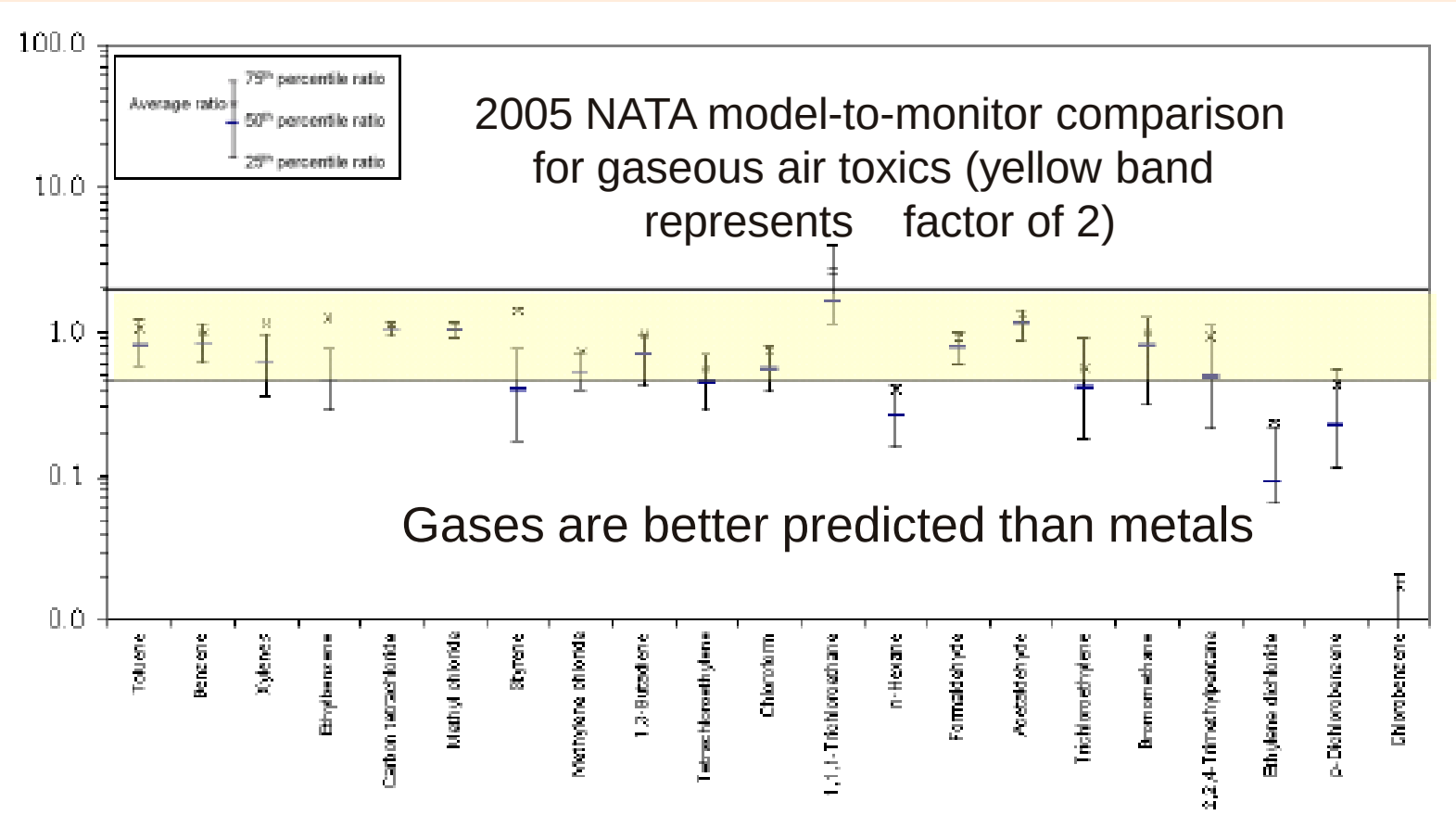
The EPA 33	
1. acetaldehyde	18. formaldehyde
2. acrolein	19. hexachlorobenzene
3. acrylonitrile	20. hydrazine
4. arsenic compounds	21. lead compounds
5. benzene	22. manganese compounds
6. beryllium compounds	23. mercury compounds
7. 1,3-butadiene	24. methylene chloride
8. cadmium compounds	25. nickel compounds
9. carbon tetrachloride	26. perchloroethylene
10. chloroform	27. polychlorinated biphenyls (PCBs)
11. chromium compounds	28. polycyclic organic matter (POM)*
12. coke oven emissions	29. propylene dichloride
13. 1,3-dichloropropene	30. quinoline
14. diesel particulate matter	31. 1,1,2,2-tetrachloroethane
15. ethylene dibromide	32. trichloroethylene
16. ethylene dichloride	33. vinyl chloride
17. ethylene oxide	

* also represented as 7-PAH

Air Toxics with Greatest Risks from Inhalation Nationally

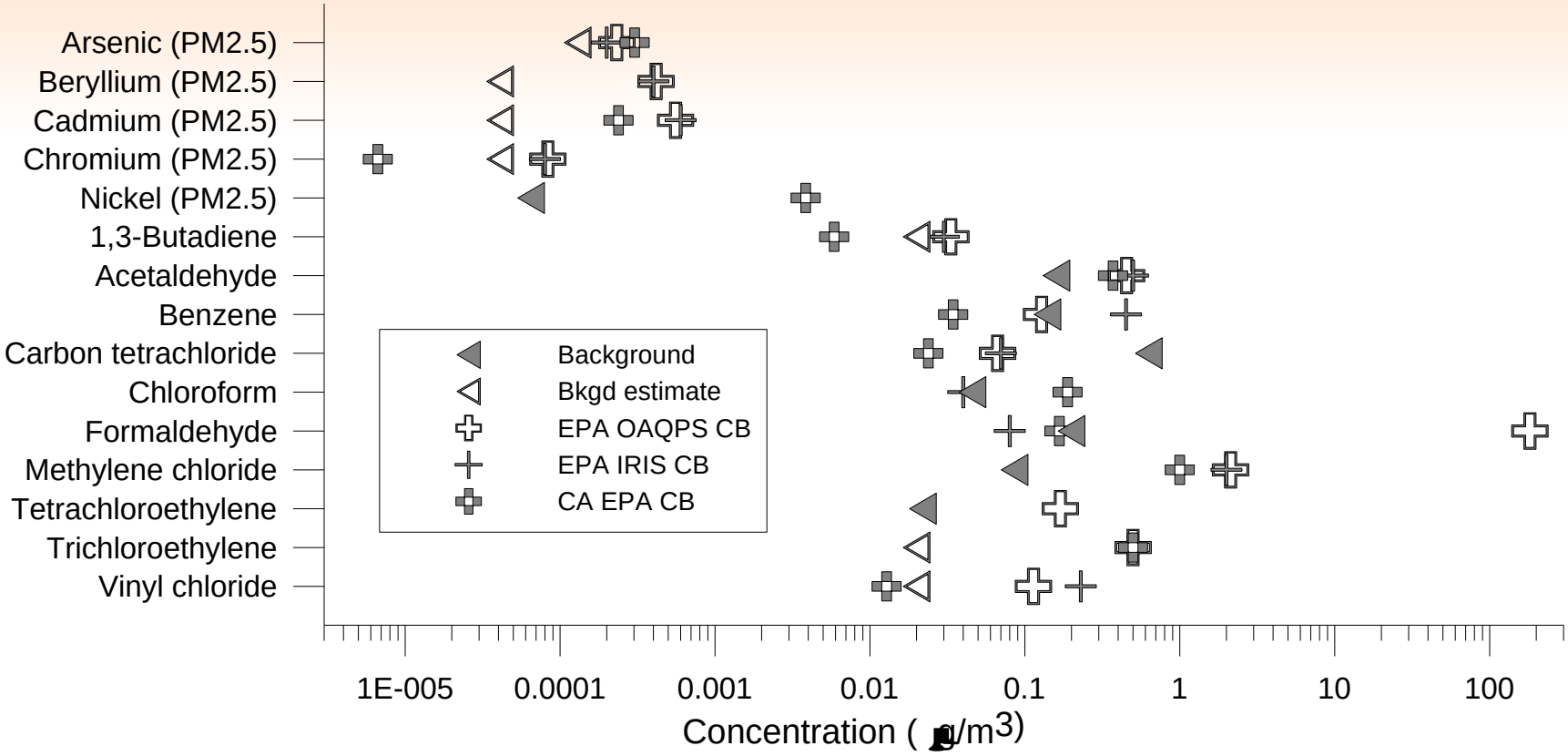
National Air Toxics Assessment (NATA) 2005 Results	
Air Toxic	**Sources**
Formaldehyde	Mobile sources, combustion, plywood, pulp and paper, oil and gas production and distribution
Benzene	Mobile sources, combustion, oil and gas production and distribution, petroleum refining and distribution
Polycyclic aromatic hydrocarbons	Mobile sources, open burning, combustion, incineration
Naphthalene	Combustion processes, mothballs
1,3-butadiene	Mobile sources, chemical manufacturing, petroleum refining and distribution
Acetaldehyde	Combustion processes, formed secondarily in the atmosphere
Perchloroethylene	Dry cleaning, solvent use
1,4-dichlorobenzene	Mothballs, deodorizers, fumigant
Ethylbenzene	Consumer products, gasoline, pesticides, solvents, glue, varnish, paint
Nickel	Oil/coal combustion, metal refining, incineration, manufacturing
1,3-dichloropropene	Soil fumigant
Acrolein	Mobile sources, combustion, open burning

Models (NATA 2005) Show Favorable Comparison to Monitoring Data



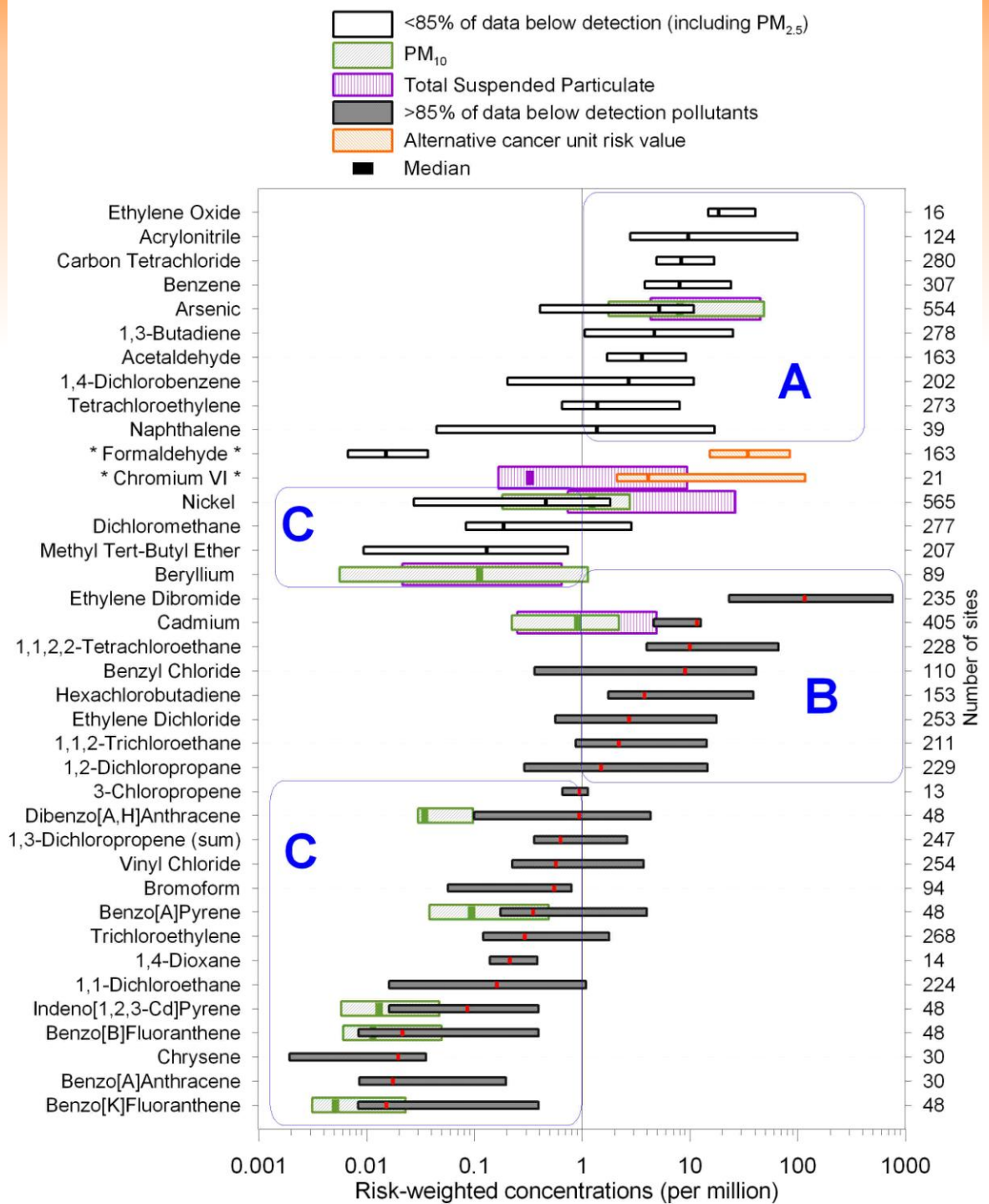
Model-to-Monitor Comparisons of Gaseous HAPs (>100 Monitors)

Background Levels Can Be Above Levels of Concern (e.g., Benzene, Carbon Tetrachloride)



Background concentrations (filled triangles) and estimated upper limits (open triangles) compared to 10^{-6} cancer benchmark (CB) concentrations from EPA Office of Air Quality Planning and Standards (OAQPS), EPA Integrated Risk Information System (IRIS), and California EPA (McCarthy et al., 2006).

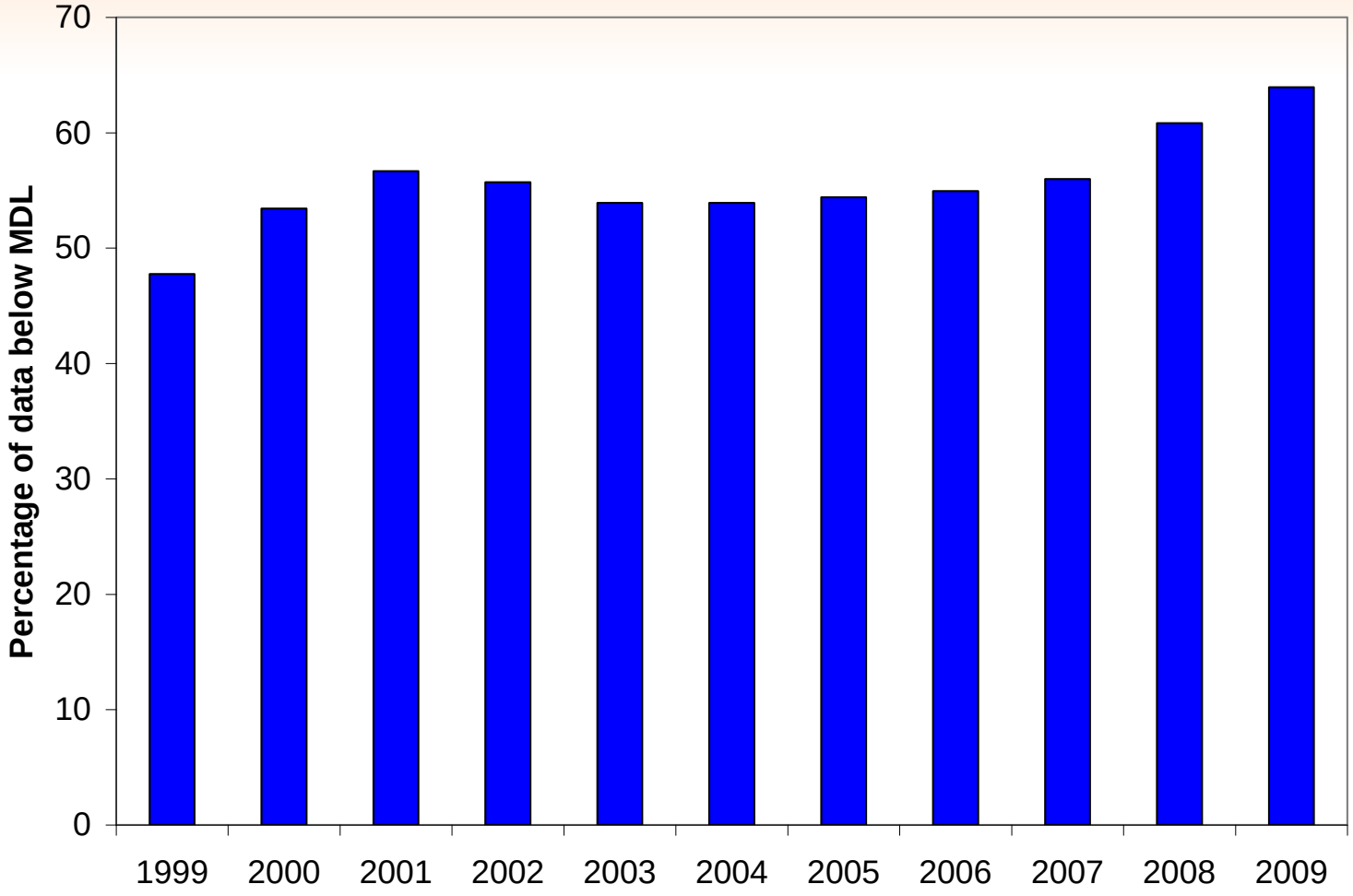
Monitoring Methods Often Have MDLs Too High to Characterize Risk

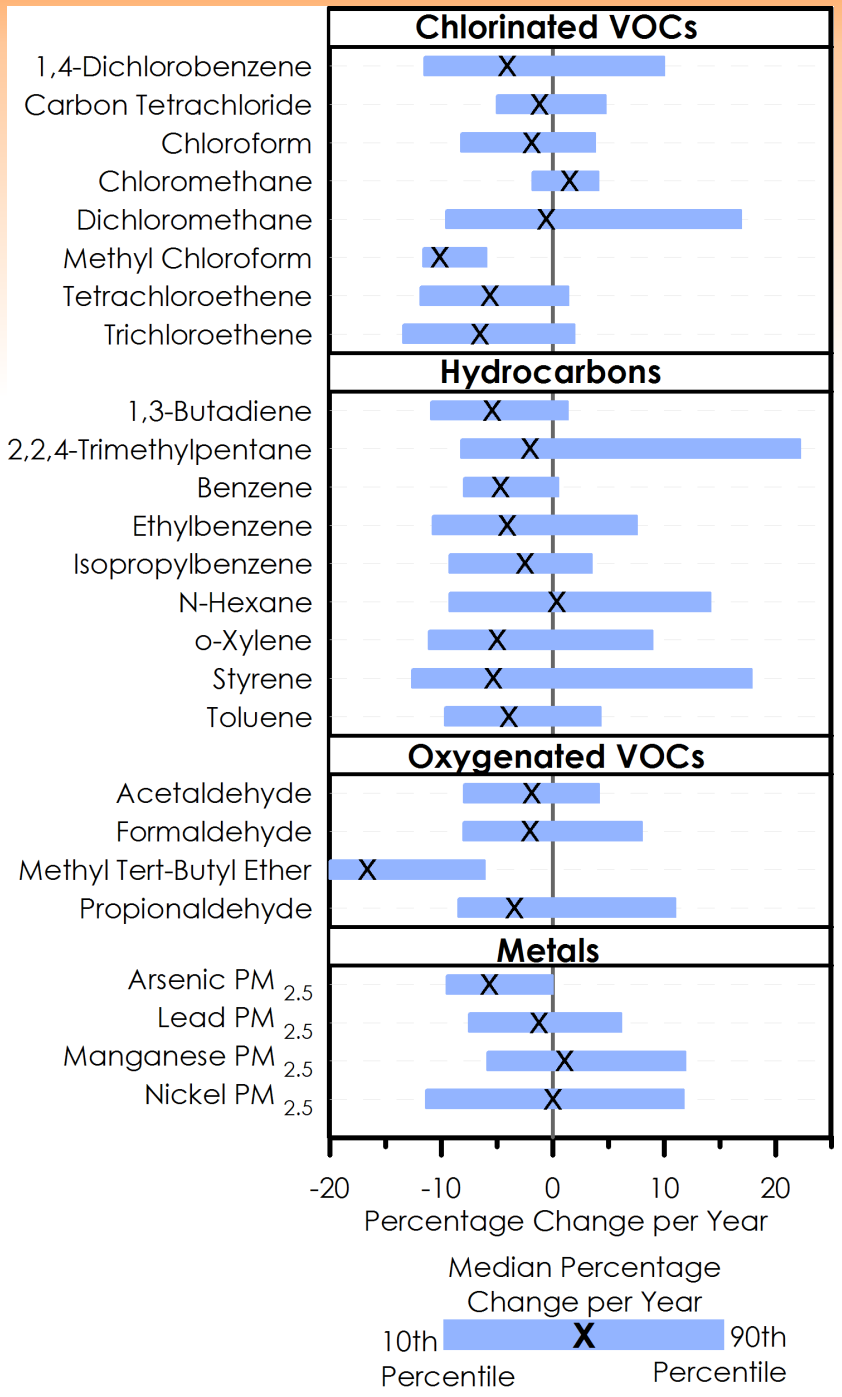


MDL = method detection limit

McCarthy et al., 2007

Most Air Toxics Concentrations Are Below MDLs

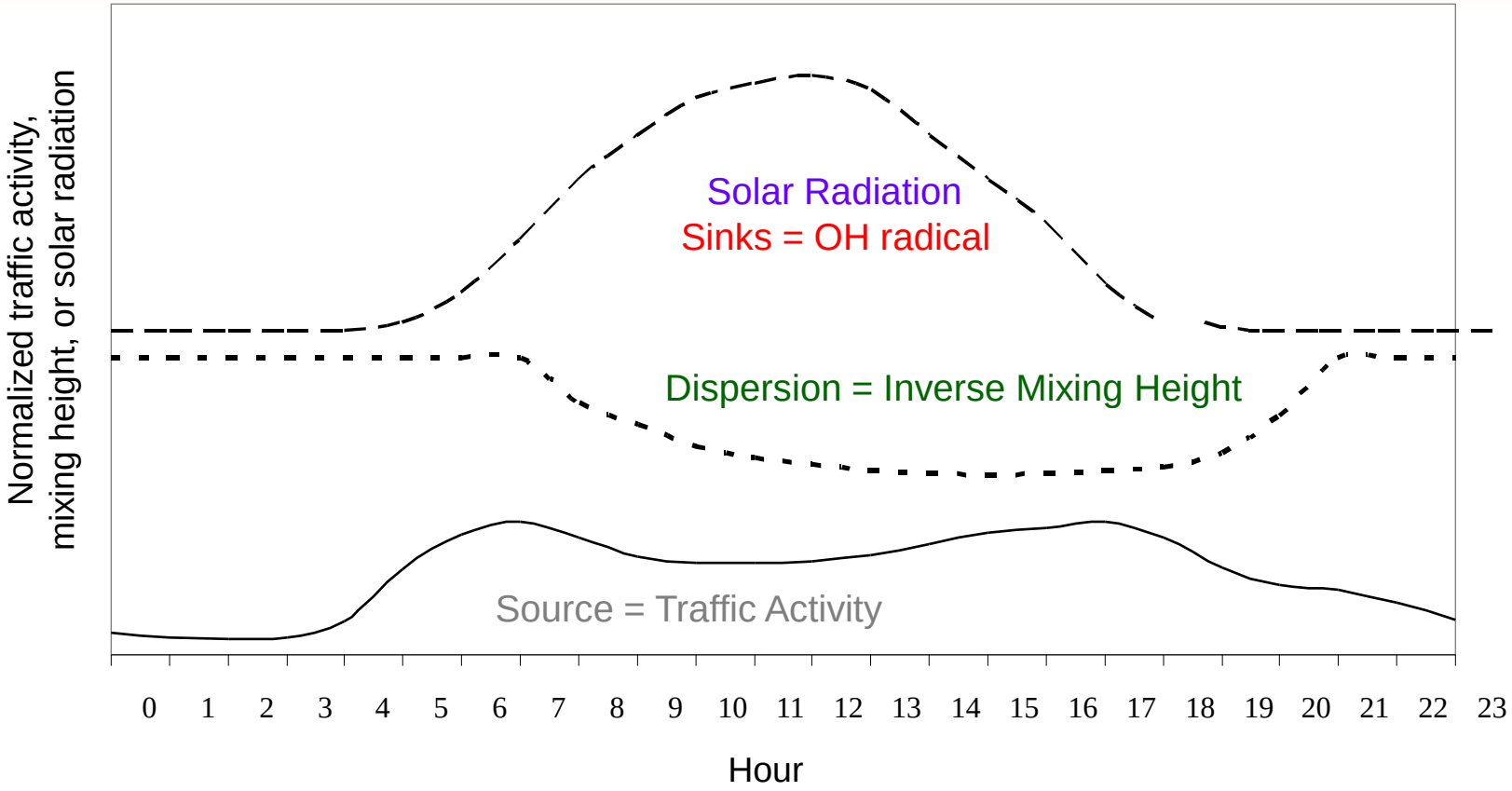




Many Air Toxics Concentrations Are Declining Over Time

Temporal Variability Can Be Used to Identify Likely Emissions Sources

Concentrations = (Sources – Sinks + Transport)/Dispersion



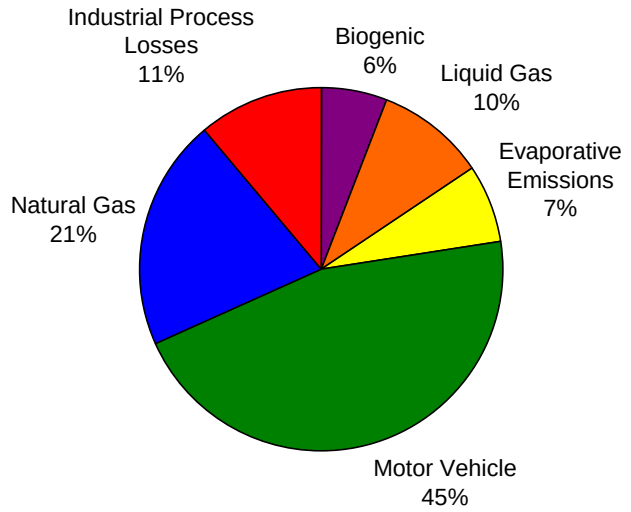
What We Know About Air Toxics At A National Level – Summary

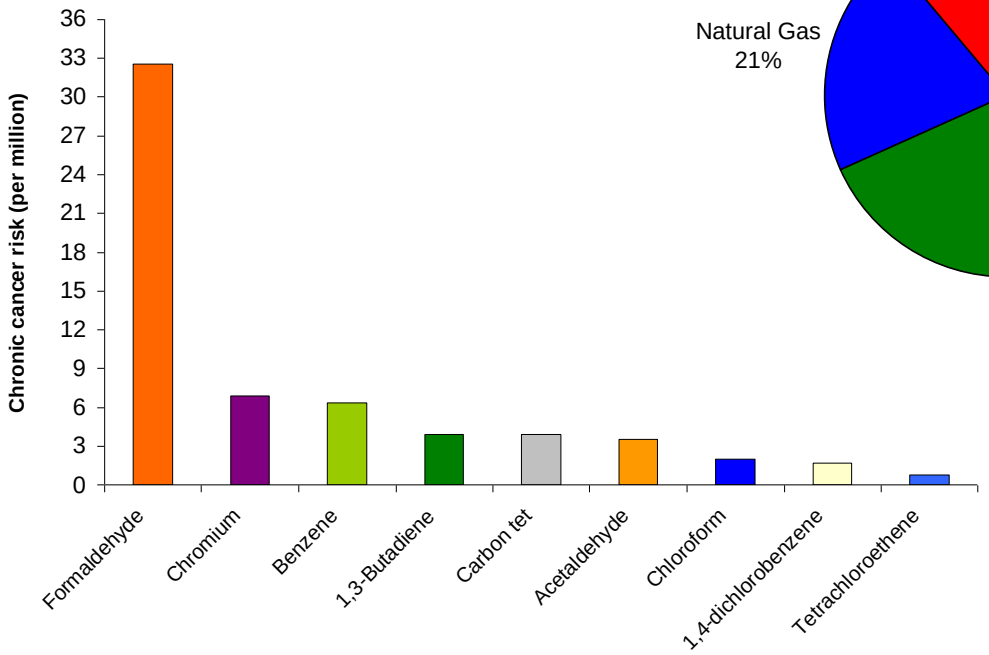
- Measuring air toxics is expensive and complicated
- Most air toxics are not routinely measured
- Air toxics with greatest risks from inhalation nationally summarized through NATA (and models show favorable comparison to monitoring data)
- Background levels can be above levels of concern (e.g., benzene, carbon tetrachloride)
- Monitoring methods often have MDLs too high to characterize risk
- Most air toxics concentrations are below MDLs
- Many air toxics concentrations are declining over time
- Temporal variability can be used to identify likely emissions sources

Topics To Be Covered Next

- Preparing Data for Analysis
- Characterizing Air Toxics Data
- Quantifying and Interpreting Trends

Apportionment of Benzene (in Total VOC) at a Los Angeles Site





Some Elements of a Successful Project

- Build on knowledge gained from previous projects and analysis results
- Plan your monitoring/analysis early and reassess often
- Look at data quickly, adjust plans accordingly, and be flexible
- Collect the data needed to answer your questions and meet your goals